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RURAL TELEPHONE SERVICE • USA

A Pictorial History of
Rural Electrification Administration's
Telephone Loan Program



Miscellaneous Publication No. 823

RURAL ELECTRIFICATION ADMINISTRATION • U.S. DEPARTMENT OF AGRICULTURE



Foreword from the Administrator

THIS YEAR, in 1960, we celebrate the twenty-fifth anniversary of the Rural Electrification Administration. It was on May 11, 1935, that REA was created by Executive Order of the President to finance the construction of electric service for rural America.

On October 28, 1949, the President signed into law the statutory authority for an additional loan program to finance the extension and improvement of telephone service in rural areas.

This book has been written in response to many inquiries from REA-financed telephone systems and many other telephone service organizations throughout the United States. We believe it will prove useful to those who direct the operations of REA borrowers in explaining REA's role to their employees, subscribers, and community leaders. It also should prove informative to telephone systems which have not applied for an REA loan but are considering such a possibility in the future.

In addition, we hope that this book will answer many of the questions REA receives each year from students who are preparing papers on REA operations or who contemplate a career in telephony. The growth of the rural telephone program has created many new and fascinating jobs, both in technical and in management phases of rural telephone system operation.

Finally, since REA is charged with the responsibility of lending public funds, we trust that this book will be a report to all Americans on the manner in which REA is discharging that responsibility.

REA itself owns no telephone facilities. Rather, it lends money both to telephone companies and cooperatives to enable them to provide rural people with modern telephone service. Although much progress in rural telephony has been made during the past decade by all segments of the industry, much more remains to be done before all rural people will have the telephones they need. We hope that this book will encourage additional development and improvement, with the aim of providing adequate telephone service to all rural areas.

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A farmer rings "Central" on his ancient magneto phone.

1. "Whoop and Holler"

LOOKING BACK, the American farmer did a remarkably good job of supplying himself with old-fashioned telephone service.

Alexander Graham Bell had first conceived the correct principle of telephone transmission in 1874, when he was only 27. He stated it this way:

"If I could make a current of electricity vary in intensity precisely as the air varies in density during the production of sound, I should be able to transmit speech telegraphically."

The following year, while working on another of his inventions, Bell heard the twang of a steel spring over an electric wire. He and his assistant, Thomas A. Watson, knew that the current transmitting that sound was strong enough to be useful. Bell gave Watson instructions for making the first telephone, and it transmitted speech sounds the next day.

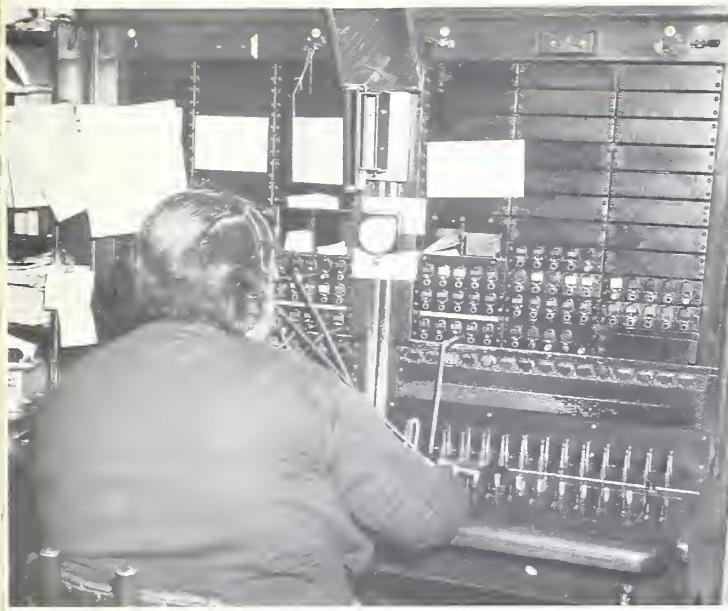
On March 18, 1876, in Boston, they produced an instrument that carried the famous sentence: "Mr. Watson, come here, I want you." With those words, the telephone industry was born.

For the next two decades, until the Bell patents expired in 1894, the development of telephony was confined largely to cities. After the basic patents were released, the Independent telephone industry began to develop throughout rural America. Both manufacturing and service organizations turned to the rural market. One company came out with a manual which told farmers how to develop their own telephone systems on a mutual or cooperative basis. Many farmer lines and mutual systems were developed during succeeding years.

Two forms of organizations were popular in rural areas. There were "pure" mutuals, or nonstock "club" lines, usually without switchboard service; there also were mutuals, which operated switchboards and generally were organized as capital stock companies. In addition, there were a number of small, family-owned companies which supplied rural service. By 1912, the number of rural telephone lines and systems had grown to more than 32,000, and the U.S. telephone industry included several manufacturers who specialized in the production of rural phones.

The most common telephone instrument was the magneto set. It was a big contraption that usually hung on the wall, and often there were 20 or more subscribers hooked to the same magneto circuit. To make a call, you first turned the generator crank a couple of times. This activated a "drop" in the operator's switchboard, signaling her that you wanted to make a call. She plugged into your lines, you lifted the receiver and told her the number you wanted.

Private conversations, so important to subscribers today, were out of the question along the magneto line. But that didn't worry the users. Rural people looked upon the telephone as a news medium as well as a communications device. On many systems, "Central," as the operator was called, was the fore-runner of the modern radio and television newscaster. Here and there, she rang all lines at seven o'clock each evening to report the correct time, the weather forecast, market quotations, sports scores, and local and even international news. She answered questions; she ran a locator service; she was the local message center. But the service was limited; as a rule, there was no operator on duty at night.



N19295

"Central" was a rural institution. Her board was crowded with messages—for the doctor, the lawyer, the sheriff. In a routine day, she would announce the birth of a baby to a dozen friends of the family, give first aid advice pending the arrival of a physician, and locate a couple of wandering husbands. This is Gladys Hanscom, Poland Telephone Co., Poland Springs, Maine.

While a lot of people called their phones "whoop and holler" sets, the truth is that they gave pretty good service when the lines were in good condition. Magneto systems continued to give *some* sort of service even after years of neglect, even though lines commonly ran from fence posts to dead trees and sometimes through fence wire. Even with no maintenance at all—with the wire hanging on the ground and falling off the insulators—you might still hear what your friend had to say if he shouted loudly enough.

After World War I, the number of farmer lines continued to grow. By 1927, when the high point was reached, there were some 60,000 mutual systems and other telephone organizations in the United States. But during the same period, the systems were deteriorating. Many failed to keep adequate accounts; a number of people were lax about paying bills; there were few maintenance men and little maintenance. Poor service became the standard in rural America.

With the depression of the thirties, lines went from bad to worse. Most mutuals stayed in business, however. They limped along, with operators sticking to their jobs despite low pay. Farmers kept trying to make calls, and occasionally they got through.

A hopeless tangle of wires enters the building housing the old manual board of the East Ascension Telephone Company, in Gonzales, Louisiana. REA financing helped replace this obsolete system with modern dial.

Rural electric lines frequently made telephone service even worse than before. After the creation of the Rural Electrification Administration in 1935, electric lines sometimes produced static on grounded telephone lines, and further reduced their usefulness. Many a small magneto system either had to go out of business or revamp its plant.

By World War II, it was clear that rural telephone systems had reached an impasse. Farmer systems, which had started so hopefully at the turn of the century, were just about finished. Rates were low and the old systems were used up without any provision for replacement capital. Actually, there were fewer farmers with telephones in 1940 than there had been in 1920.

Many cities, on the other hand, were enjoying automatic dial service by 1940. It was clear to many telephone people that the only way farmer lines would ever be made serviceable would be to eliminate the

Continued on page 6



14378



14559

Wire on old magneto line is hooked to fence, evidence that many farmers talked through their barbed wire fences in days gone by.



REA posters helped new borrowers spread the good news.

11058

The people really turned out for the dial cutover celebration of the Fredericksburg and Wilderness Telephone Company, Chancellor, Virginia, which placed the first REA-financed telephone facilities in service in September 1950.

one-wire grounded service. But this presented a need for large amounts of capital which were not generally available to the smaller companies. The farmer mutuals and other companies, with their poor financial history, were in no position to borrow money.

Some people, even in the thirties, thought that the Government would have to lend a hand. In 1939, John M. Carmody, then REA Administrator, wrote an editor in North Carolina:

"Personally, I have long felt that there was a real opportunity for constructive assistance to rural people in the idea of Federal financing of farm telephone lines. It seems to me that rural people have just as much right to up-to-date communication as they have to modern power. There's no question in my mind but that Government assistance will be required if the job is ever to be completed."

Others agreed. In late 1944, Senator Lister Hill of Alabama introduced a bill to establish a Rural Telephone Administration, modeled after the already successful Rural Electrification Administration. Starting in 1945, both Senator Hill and Representative W. R. Poage of Texas introduced measures in each session of Congress to establish rural telephone loan programs.

Action came in 1949 on bills to amend the Rural Electrification Act. Extensive hearings were held on the Poage bill in the House and on the Hill bill in the Senate. The latter measure had the sponsorship of a bipartisan group of 10 other Senators.



During hearings, many witnesses testified to both the need and demand for rural telephones, for "area coverage," for a source of long-term financing to permit the change from magneto to dial. It was pointed out that only about 38 percent of U.S. farms had any form of telephone service. It was shown that rural service was obsolete in many places, and that private and public agencies had failed to make long-term, low-cost credit available.

Before the Senate committee, REA Administrator Claude R. Wickard testified that farmers needed adequate telephone service even more than city people did.

He said: "With the possible exception of electric power, it is hard to conceive of anything that means more to the health, happiness, and economic well-being of farm people than good telephone service. In time of sickness, fire, or other emergencies, a farmer without a telephone is practically helpless . . . The farmer must have fast, dependable communication service if he is to be able to produce efficiently and economically the food and fiber upon which this Nation depends for its existence. For example, during the harvest season, a quick call into several towns may be the only means of locating an essential repair part for a piece of machinery and of saving a crop . . . Prompt veterinarian service and adequate and detailed local market information can be quickly and effectively made available only through a reliable telephone . . . From a social standpoint, the farmer's wife and family, because of their isolation, have much more need of telephone service than any other group of citizens. Looking at it from every angle, no group of people needs telephone service as much as farmers."

Some witnesses for the telephone industry, on the other hand, thought that a Federal telephone loan program would be unnecessary and unwise. Several thought REA would be unqualified to function in the telephone field, with which the agency had had no experience. Others emphasized possible dangers in telephone loans to public bodies, and they raised the prospect of federally financed competition with existing facilities. They pointed at possible duplication of lines.

These objections were considered carefully, and changes in the original bills were adopted by both the House and Senate. Changes affirmed the jurisdiction of State regulatory commissions over REA telephone borrowers and eliminated public bodies as possible recipients of telephone loans. Another change gave a preference to existing telephone organizations.

But the view of the bill's sponsors—that rural systems needed some sort of long-term financing if they were to survive—won out. The telephone amendments to the Rural Electrification Act of 1936 were passed by the Congress and signed into law on October 28, 1949.



Manager Lloyd G. Vaughan, of the Flora Telephone Co., Flora, Alabama, shows a subscriber how to reach a party on her new-fangled dial telephone. Mr. Vaughan's company was the first to receive an REA telephone loan, on February 24, 1950.

11573



One company holds a mock funeral for a crank phone during cutover ceremonies. While the magneto phone passed unmourned, many sincerely missed the voice of the central operator.

14200

2. A New Loan Program

THE NEW LEGISLATION made the telephone loan program the responsibility of REA, which had been created in 1935 to finance rural electric systems. In the preamble, it was declared to be the policy of Congress "that adequate telephone service be made generally available in rural areas . . . to

the widest practicable number of rural users of such service," thereby extending REA's now famous "area coverage" principle to the new telephone program. The term "rural area" was defined as any area not included within a town and village having a population of more than 1,500.

The REA Administrator was authorized to make self-liquidating loans, at an interest rate of 2 percent, for a period up to 35 years, for the extension and improvement of rural telephone service. Among other things, the new law provided that:

- The REA Administrator certify that each telephone loan, in his judgment, would be repaid within the time agreed.
- Loans could be made for the acquisition of existing telephone lines or systems, where the acquisition serves the statutory purpose of extending or improving rural telephone service.
- During the first year of the program, a preference would be granted to applications from telephone companies already in operation. These would be acted upon before applications from new enterprises planning to serve substantially the same subscribers.
- A portion of a telephone loan could be used to acquire or construct facilities in nonrural areas, and that outstanding indebtedness could be refinanced, if the Administrator determined that such action would be necessary to extend or improve rural service.
- Public bodies, such as municipalities or other governmental units, were not eligible for REA telephone loans.
- Loan applicants would have to comply with applicable State laws and requirements of State regulatory bodies. In cases where applicants were not required to obtain certificates of convenience and necessity under State laws, the Administrator was required to "determine that no duplication of lines, facilities, or systems providing reasonably adequate service will result" from the making of a loan.

This was the law; it was REA's task to administer it. The new program began with a staff of three people—an engineer, an information specialist, and a secretary. Their job was to answer inquiries sparked by the new legislation. It wasn't long before the trio learned that nobody knew all of the answers.

Should REA make 100 percent loans? If not, what equity should be required? Should loans be made for the full 35 years required by law? How could area coverage be accomplished? REA and the USDA legal staff had to find answers to many difficult questions before the program could go into operation.

Two REA loan programs financed construction along this country road. On right is standard aerial wire telephone plant; on left are electric lines.





Near Elizabethtown, North Carolina, dairy farmer J. R. Powell was one of the first to sign up for a new dial phone.

X18092

Also, REA faced the job of assembling a trained technical staff. Telephone technicians were trained, by and large, by the Bell system and by telephone equipment manufacturers. In the postwar building boom, telephone companies and equipment makers were also recruiting trained men, and REA found it difficult to match the salaries offered by private enterprise. Competition for personnel was keen.

REA gradually employed from the industry, and transferred personnel from its electric loan program to provide a nucleus of a telephone staff. The services of a number of retired Bell employees also were acquired on a consulting basis. By June 1950, when the program was less than a year old, there were 142 full-time employees in the telephone program.

The top men at REA undertook a formidable task of self-education, formulating policy, and working out loan procedures. They knew that sound financing would depend upon how well they solved a number of pressing problems. For one thing, many existing farmer mutuals were too small to handle the cutover to dial operation. They would have to merge or consolidate with other small systems in order to establish more efficient operating units.



14338

Town and country are interdependent today. The town merchant likes to be able to dial the farmer direct, and the farmer needs to have a direct line of communication to town. Extended area service (EAS) is the answer in many communities.



N19310

A number of small family-owned telephone systems turned to REA for financing. One was the Breezewood Telephone Co., at Breezewood, Pennsylvania. Here (left to right) are: Howard Nave, manager; Pearl Nave, secretary-treasurer, and Walter Nave, president.

REA also had to decide what type of service would be financed under its new loan program. The development of the industry had usually involved three major steps—from magneto, or grounded service, to common battery, and finally to dial, or automatic exchanges. The conversion to common battery eliminated noise and gave a higher grade of voice transmission generally. Dial service called for still higher standards of construction and maintenance in order to function properly.

Because dial service eliminated manual operations, because of the convenience of automatic dial switching, and because of the generally better service it afforded, REA decided to make loans only to finance the most modern type of service. Under this policy, REA loans are predicated on conversion to dial service, as well as systems planned to serve the widest practicable number of rural people.

REA had to find a way to estimate the market for telephone service in each area. Acceptable construction and equipment standards had to be written. Finally, the agency had to develop procedures for determining that each loan would serve the widest practicable number of rural users. It had to develop feasibility standards. It had to assure rural subscribers of adequate service at reasonable rates.

Not all of the decisions made in those first months proved workable. At first, REA felt that borrowers should provide equity capital as part of the agency's



The Telephone and the Farmer

IN LATE 1951, REA released a 28-minute color sound film, "The Telephone and the Farmer." It was widely used by telephone cooperative organizing groups and at community meetings, and the film is still in demand today.

loan security requirements. Commercial companies were required to provide from 20 to 30 percent equity, while cooperatives and other nonprofit organizations had to supplement loans with payments from \$25 to \$50 per subscriber. Later, REA found that these equity requirements were not obtaining the desired results. In practice, the agency learned that equity was not as important to the security of the Government loan as were the development of sound operating units and careful management. REA therefore lowered, and in some cases abolished, its equity requirements. At the same time, it established better management controls over its borrowers.

The Act provides that not more than 40 percent of any particular loan may be used to refinance an operation. This meant that any company borrowing Federal funds for refinancing would have to use the bulk of its loan to expand and improve rural service.

REA adopted a conservative policy in making loans for refinancing and acquisitions. It required that applicants justify acquisitions in terms of the amount of rural expansion and development which would result. Loan funds for acquisitions were generally limited to the REA-appraised value, with borrowers contributing as equity capital any excess in acquisition cost over the REA appraisal.

While the principal purpose of any REA telephone loan must be to serve rural areas, REA approves loans to provide service to urban areas if the money required for improving and expanding service in the

surrounding rural areas is greater than that needed in town.

This was an important decision—and a proper one. Today's farmer is not interested in limited telephone service which connects him with a few other farmers down the road. He has outgrown the old switcher lines of his father's day. The farm family today is tied to the economic and social life of the nearby town or city. That is where he markets what he produces; where his family shops. It is to the community center that his family goes for entertainment, to visit friends and relatives, to church and school, and to obtain all types of services. He needs to be able to dial town numbers; the townspeople need to dial the farmer.

REA financing, therefore, accelerated a trend which was already beginning to make good business sense. The telephone industry had been moving toward a new pattern of service, which reached out of towns to include the surrounding countryside. The cost of rural telephone construction in thinly settled areas was prohibitive, but REA borrowers found that they could achieve satisfactory operating margins by combining the rural areas with the associated towns and community centers.

Extended area service, which enables subscribers in a combined community of interest to dial each other direct, without paying a toll charge or calling a toll operator, has expanded rapidly. In many areas both town and rural subscribers are willing to pay the rates necessary to support this added convenience.

The International Edinburgh Film Festival awarded the motion picture a special diploma in 1952 in its "Realist-Documentary-Experimental" class. It also

Star of "The Telephone and the Farmer" was Mrs. Phyllis Sprecker, a Scarville, Iowa, housewife. In this scene, she tries unsuccessfully to phone the doctor after her husband has suffered a heart attack. Near hysteria, Mrs. Sprecker then drives off to town on a tractor to get a physician.

13281



was selected for showing at the International Exhibition of Scientific and Documentary Films in Venice the same year.

12379



3. Picture Story:

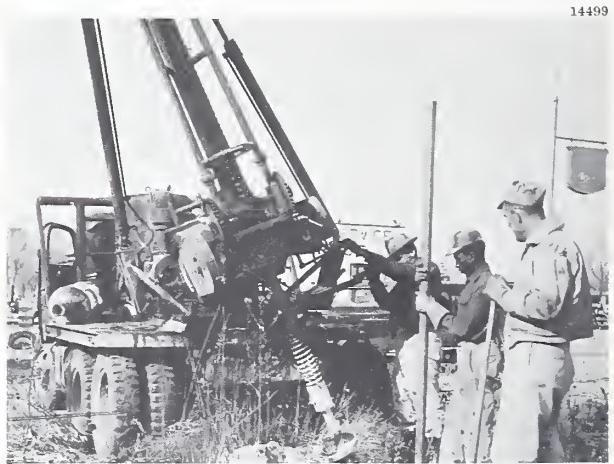
Building a Modern System

14450



... and the wire and insulators. (Eastern New Mexico Rural Telephone Cooperative, Clovis)

14499



The digging machine goes to work ...

14512



... and new poles appear beside old. (Roosevelt County Rural Telephone Cooperative, Portales, New Mexico)



A ditching machine helps bury cable through town ...

14474



... and the farmer gets his service drop.

N19756



... and the man finally shows up with that telephone.
(Merchants and Farmers Telephone Co., Montpelier,
Virginia)

11932



... and she can finally hear her neighbors, six miles away.



The lightning arrestor goes on the side of the house . . .
(Powell Telephone Company, Powell, Tennessee)

14233

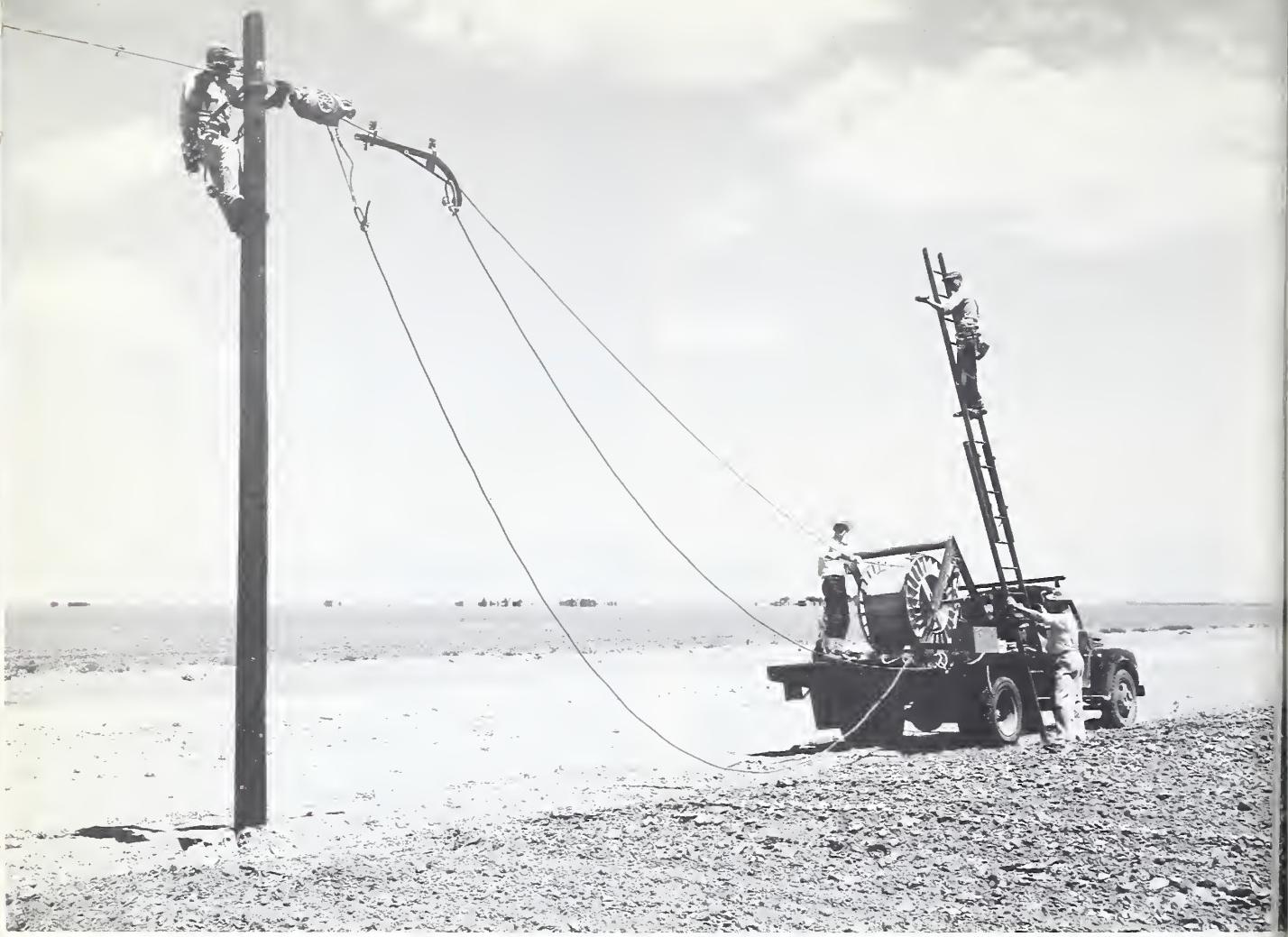


The installer puts it where the housewife wants it . . .

14436



Aftermath: The old phones, ready for the ingenious
antique dealer.



4. Getting an REA Loan

SUPPOSE THAT a telephone system operating in a rural area needs capital funds to provide new telephone service or to improve its old service. Its president writes REA in Washington indicating his interest in securing a Government loan.

REA responds by assigning a field representative to call on the utility. The representative explains REA requirements for a telephone loan and offers his help in developing the necessary supporting data.

One of the most important of the supporting documents is a forecast of service requirements—or market survey—which shows the number of subscribers needing new or improved service. When the market survey is complete, the applicant engages a qualified

engineer who works out a basic system plan, showing in detail the facilities needed to satisfy the subscribers counted in the survey. The system plan also indicates the amount of money necessary to construct the facilities.

When the applicant has completed its market survey and system plan—and worked up other data—it submits the material to an REA Area Office in Washington in support of its loan application. If REA finds the project acceptable after its own legal, engineering, economic, and financial studies, it obligates funds through a loan contract, and the new borrower gives a note, mortgage, or other security.

Before REA actually advances loan funds, however, the corporate structure of the borrower must be sound, property titles must be cleared, and REA must approve engineering and construction plans and specifications. To help borrowers meet REA's technical standards, the agency has published a Telephone Engineering and Construction Manual. Continuously expanded and revised, the book is now considered by

Continued on page 16

At South Plains Rural Telephone Cooperative, at Lubbock, Texas, linemen feed out telephone cable from moving reel. The small machine near the pole lashes the cable to a steel support wire, which was strung earlier. Cables used in REA-financed projects may contain as few as 6 wire pairs and as many as 600.



From the central office, a man can use this wire chief's test set to check outside line after a trouble report. Without leaving his chair, he can find out whether the line is grounded, a pair is shorted, or a receiver is off the hook. He also can tell approximately where the trouble is before he dispatches the repairman.

Repairing a telephone instrument after it has been dropped by a subscriber's child, a typical rural "combination man" also installs phones, repairs lines, and handles trouble shooting.



Electric line poles already in place can be used on a rental basis to carry telephone lines to farms and rural homes. In this picture, electric distribution wires at the top of the pole and telephone wires on the crossarm cut construction costs through a joint use contract. About 30% of pole lines used by REA telephone borrowers are under joint use contracts.



many to be the only complete publication containing technical information on general telephony.

Borrowers also must meet applicable requirements of their State regulatory bodies before REA funds are advanced. After that, funds are advanced as needed for specifically approved purposes. When projects have been finished and contracts closed out, REA field representatives examine the expenditure of

loan funds to make sure that they have been used according to plans.

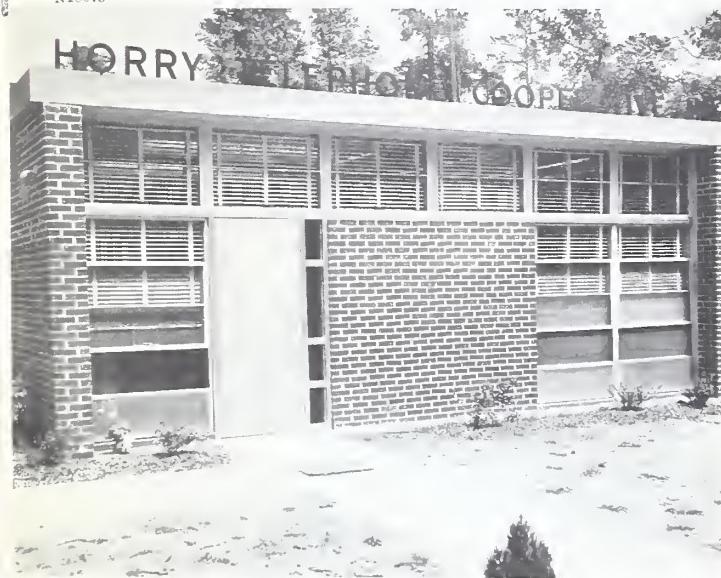
After primary construction has been completed, REA borrowers must provide annual audits by certified public accountants. REA continues to work diligently with its borrowers, however, to develop sound service organizations capable of carrying out their obligations in a businesslike manner.

14264



Flat barge lays submarine telephone cable across bayou near Golden Meadow, Louisiana, headquarters of La Fourche Telephone Company.

X18075



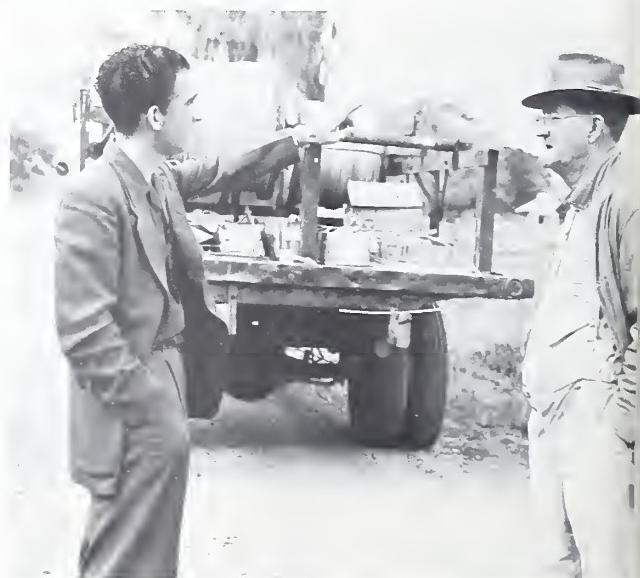
Representative of new buildings being constructed by REA telephone borrowers is the small, attractive and functional headquarters of the Horry Telephone Co-operative, at Conway, South Carolina.

16

x2



Each telephone pole has its own number, enabling a lineman to be dispatched to a particular pole in the system. On this one, the line is number 7E; the pole is the 15th on that line.



At East Ascension Telephone Co., Gonzales, Louisiana, J. P. Lambert (left) shows a new subscriber how the service drop will come to the house. Telephone men plan service drops so that they will not interfere with farmers' machinery or the driveway.



Mrs. Helen Thompson is a toll operator for Farmers' Mutual Telephone System, Edinburg, Virginia. Direct distance dialing is easing the burden on toll center operators.

5. Around the World

BELL CALLED his invention a "telephone receiver." At first, it was a single instrument, placed alternately to the mouth or ear, for talking and listening. Its design has been continuously improved.

In 1938, the familiar single-unit hand-set appeared, combining the transmitter, receiver, and bell mechanism in one instrument, with no bell-box on the wall. This instrument has more than 150 separate parts.

The base contains a transformer, dial mechanism, ringing mechanism, resistors, varistors, and a switching device to turn electrical current on and off. When you lift the hand-set off the cradle, a continuous d.c. electric current starts to flow through the transmitter circuit. Sound waves of your voice strike a drum-like diaphragm, the center of which is surrounded by a chamber containing carbon granules. As the diaphragm vibrates, it presses on the granules, causing them to change their electrical resistance. This changes the current flow through the circuit to correspond with the sound waves. Thus, sound energy, now converted to electrical energy, is transmitted over the wire.

The currents are carried by wire to the receiver (the

part the person you are calling listens with) and then changed back into sound waves. The receiver contains a ring-shaped magnet system around a coil, and an iron ring armature. Current in the coil makes the armature vibrate in the air gap. An attached fabric diaphragm, shaped like a dome, vibrates too, setting the air in the canal of the ear in motion. Presto—your friend hears what you are saying, around the corner or around the world.

The old-fashioned magneto telephone, still used in many parts of the country, has its own battery to provide transmitting current. REA telephone borrowers are installing modern automatic dial equipment to replace these out-dated telephones.

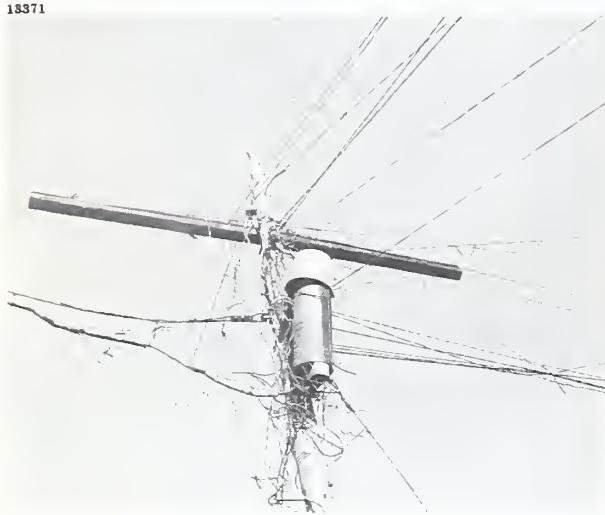
Another modern convenience rural subscribers can have today is selective ringing. Instead of every phone ringing on a 10-party line, whenever one call comes in, only one phone rings. This is done by using up to five "ringers" on each line, each one responding to a different ringing frequency.

Today's rural telephone service provided by REA-financed borrowers is fast, efficient, and modern in every respect.

6. Picture Story:

The Central Office

13371



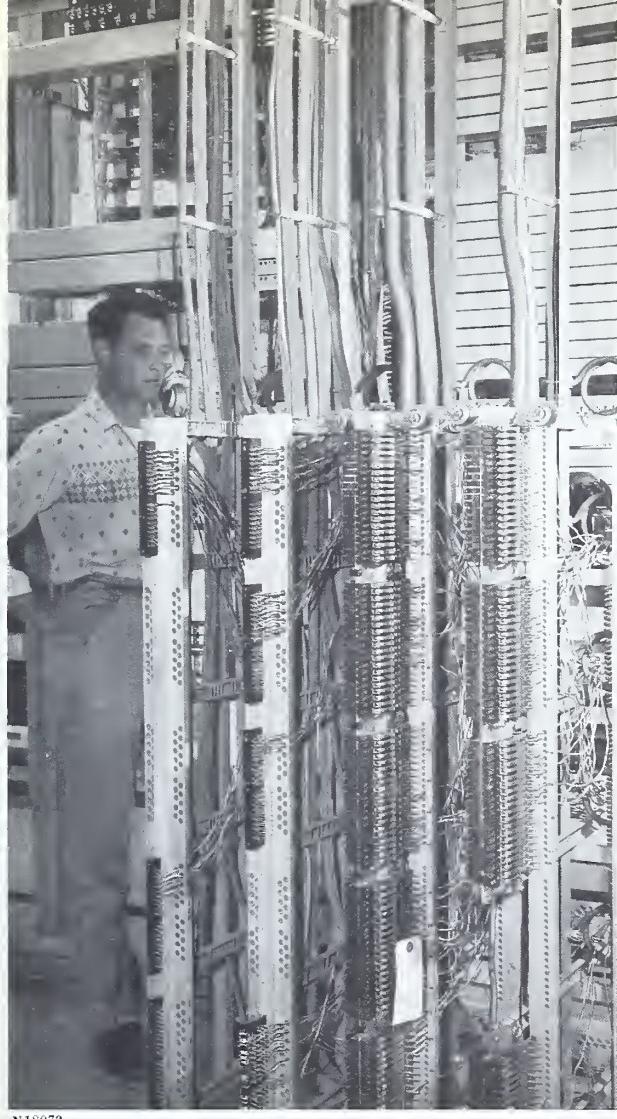
Mounted on this "office pole" (the pole next to the central office) is an old-style cable terminal, a rat's nest of wire pairs. It is protected by a can and topped with a bucket. (Below) Modern "office pole" has neat telephone cables (dark lines) running to central office and to subscribers. Lighter wires are trunk lines to other exchanges and toll center. Lineman is testing for trouble on a line.

N19314



The "brains" of an automatic dial system are usually housed in small windowless buildings, like this dial exchange owned by the Farmers Telephone Cooperative, at Lane, South Carolina. The complicated electromechanisms inside connect each party who dials a number with the party he calls. In an average office handling 200 lines, the equipment inside costs about \$30,000. The exchange is unattended; a maintenance man visits it only twice a month, as a rule. In case of trouble, alarms notify telephone company headquarters, and a man is dispatched to correct it.

The "jumper" runs to a line circuit. Circuits are housed under the "cans" in the lower center. When the subscriber dials a number on his new telephone, he is connected by his line circuit and a line finder to a local selector.



N18073

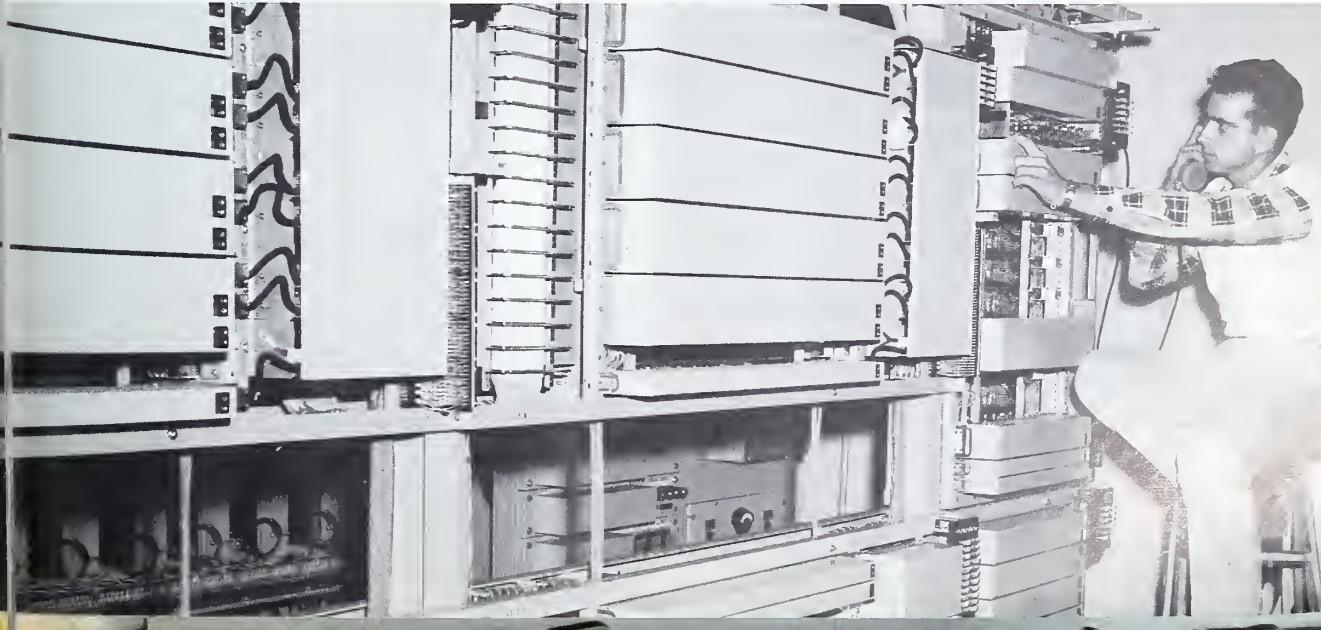
Outside cables, each containing many pairs of wire, enter this typical dial central office at the ceiling and drop down to the main distributing frame. Pairs terminate in the framer, where each is hooked to a pair of protectors.



N19762

A central office technician makes a connection for a new subscriber. He solders a "jumper" to the pair of wires which have come all the way from the subscriber's home, connecting them to an inside pair. Now the new subscriber is hooked into the automatic dial switchboard.

N19279





N19306

All-concrete exchange buildings are the pride of Pioneer Telephone Cooperative, Philomath, Oregon. The offices are weatherproof, fireproof, and vandalproof.



In this type of equipment, selectors are located in "cans" at the bottom of the automatic switchboard. When the subscriber has dialed the first digits of the number he is calling, the selector routes the call either to a toll operator, to another dial office, or to a local connector. The local connector records the rest of the digits dialed and connects the subscriber to the desired party.



Storage batteries in every central office supply electricity in case the outside power fails. These batteries can operate the office for at least 8 hours if the main power supply goes out.

Electricity is converted to 48 volt, direct current in the central office. It then goes to this power board for distribution to various units of the switchboard.





REA Engineer William P. Stokesberry explains the operation of a wire chief's test set. Stokesberry has lectured before scores of maintenance men working for REA telephone borrowers, as part of REA's program of technical assistance.

7. Safeguards

TO SAFEGUARD the security of its loans, REA has a field staff working with its borrowers as needed. The agency keeps an average of about three field people in each State. They are specialists in engineering, accounting, management and loans.

An REA field telephone accountant, for example, will assist a borrower in setting up proper accounting procedures. Prior to REA, many telephone systems used the old single-entry books or none at all. REA field representatives helped them establish double-entry bookkeeping, as more and more State regulatory bodies and REA required detailed information.

The REA management and loans specialist helps the borrowers with its day-to-day management problems and in the preparation of detailed loan applications to REA.

The REA field engineer is available to provide technical assistance to a borrower relative to system planning, construction, maintenance, and operation.

In July 1953, REA issued its Telephone Operations Manual, designed to assist borrowers in setting up operating routines in five major categories: general, plant, traffic, commercial, and accounting. This loose-leaf book, ever expanding, has become invaluable.



Meeting under auspices of their State telephone association, telephone bookkeepers in Indiana held a 2-day seminar to study accounting methods for small rural telephone systems.



At the Roosevelt County Rural Telephone Cooperative, Portales, New Mexico, Wanda Hillgard writes an order for a new installation. She uses the system map to find location of the new subscriber and to determine which cable pair is involved.

able to REA borrowers and the Independent telephone industry as a whole.

REA also provides assistance to borrowers who are finding it hard to get on or stay on the black-ink side of the ledger. Where needed, REA personnel assist in preparing comprehensive management studies and finding solutions to their management problems. REA already has completed 41 of these analyses, and 39 borrowers have either reduced or wiped out their operating deficits since the studies were made.

REA also helps borrowers who need more business or who are contemplating rate increases. Borrowers trying to attract enough subscribers to make a telephone system self-supporting are assisted with local promotions to sell new stations, extensions, barnyard telephone gongs, coil cords, and color instruments.

In giving help as needed, REA always recognizes the independent character of its borrowers. The agency's guiding policy on its relationship with borrowers states that REA "shall render certain technical advice and assistance to its borrowers" to protect the



First organized in 1954, REA's Telephone Advisory Committee is comprised of representatives of REA borrowers and other segments of the telephone industry. Meetings are held periodically in Washington, D.C., to discuss the status of the telephone program. Following each meeting, the committee submits recommendations to the Administrator, suggesting ways to improve and encourage the expansion of telephone service.

Participants in a recent meeting, together with REA and USDA officials, are, left to right:

Seated—Roy C. Boecker, Kingfisher, Okla.; W. G. Winters, Houston, Tex.; Norman H. McFarlin, Asst. REA

Administrator; Kenneth L. Scott, director, Agricultural Credit Services, USDA; David A. Hamil, REA Administrator; Ralph J. Foreman, Deputy REA Administrator; William C. Henry, Bellevue, Ohio; Harold G. Payne, Greensburg, Pa.; Fred R. Harris, Brooklyn, Mich.

Standing—Edward D. Hildreth, Alexandria, Tenn.; J. P. Maguire, Taft, Calif.; Harold L. Ericson, Hector, Minn.; Donald Dickson, Rupert, Idaho; Clyde E. Eskridge, Canton, Ill.; Downing Musgrove, Homerville, Ga.; Orla L. Moody, New York, N.Y.; Harold C. Ebaugh, committee chairman, Havre, Mont.; James A. Cobb, Sanford, N.C.; D. J. McKay, La Crosse, Kans.; and Joe Roberts, Gallatin, Mo. Riggs Shepperd, another member, was absent.

security of the Government loans. It also states, however, that this help "shall progressively diminish" as borrowers gain in experience and maturity.

The underlying objective of REA, the policy points out, is to move as quickly as possible toward a situa-

tion "in which every borrower possesses the internal strength and soundness to guarantee its permanent success as an independent local enterprise." This goal is in keeping with the fact that each borrower is an independent corporate body.

N19757



Extra loud bell in barnyard signals dairy farmer to answer barn extension.



REA also assists with promotions to sell extension phones, color sets, and barnyard bells.



The Hardy Telephone Co., in Moorefield, West Virginia, uses posters designed by REA's Information Services Division to increase the number of subscribers.

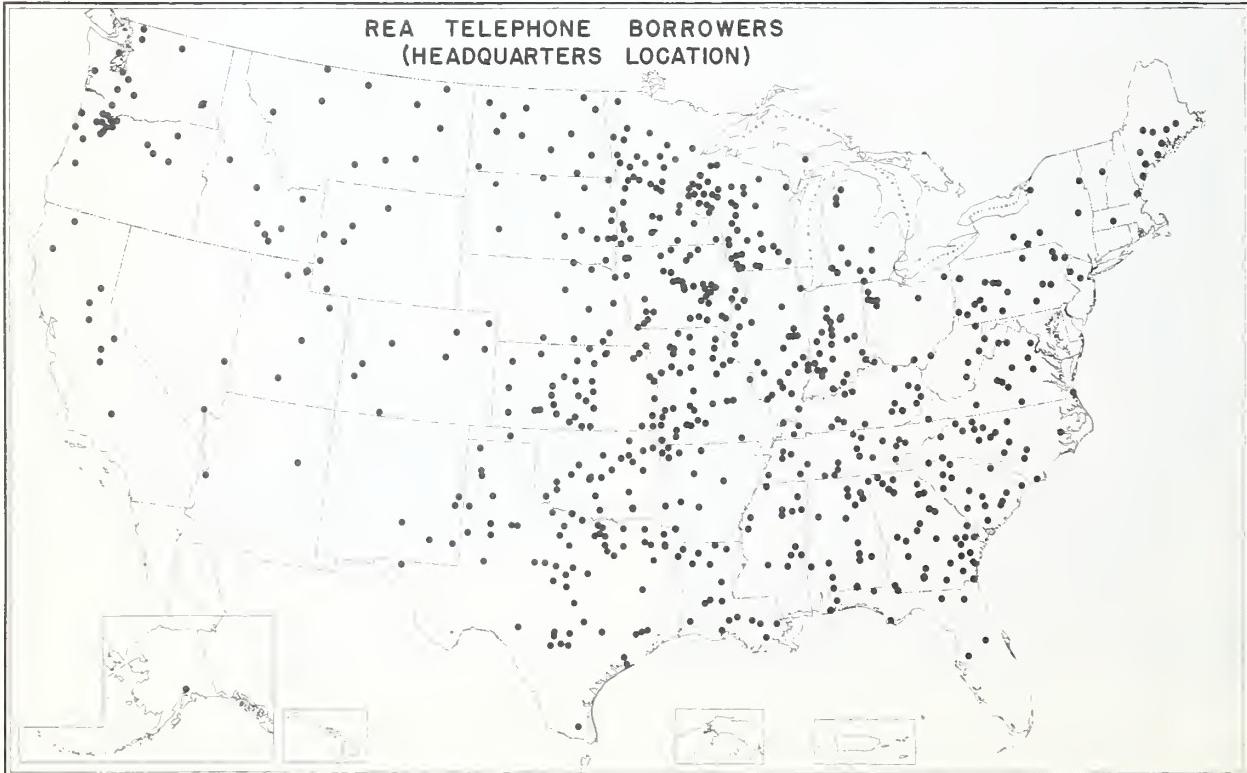
8. The Record to Date

IN THE DECADE that elapsed between the signing of the telephone amendment to the Rural Electrification Act and December 31, 1959, REA approved a total of \$633 million in loans to 686 borrowers. About a third of the borrowers are cooperatives; two-thirds are commercial telephone companies. They are located in 45 States.

A total of \$453 million in funds had been advanced by the end of 1959, and REA borrowers had put more than one million telephones in service. Nearly one million subscribers were using these telephones, and 330,000 of them were receiving service for the first time. More than twice this number were receiving their first dial service.

But that is only part of the story. Rural telephone borrowers had repaid \$14.2 million of the principal to the Government, and had paid \$11.8 million in interest. About \$2.6 million on December 31, 1959, represented payments made in advance of due dates. Only 10 borrowers were delinquent in payments more than 30 days.

Telephone borrowers in 45 States dot the countryside, providing efficient and modern communication service for America's rural population.



Nationally, the percentage of farms with some type of telephones rose in the decade just past from about 38 percent to about 60 percent.

But much more remains to be done before all rural Americans have dial service.

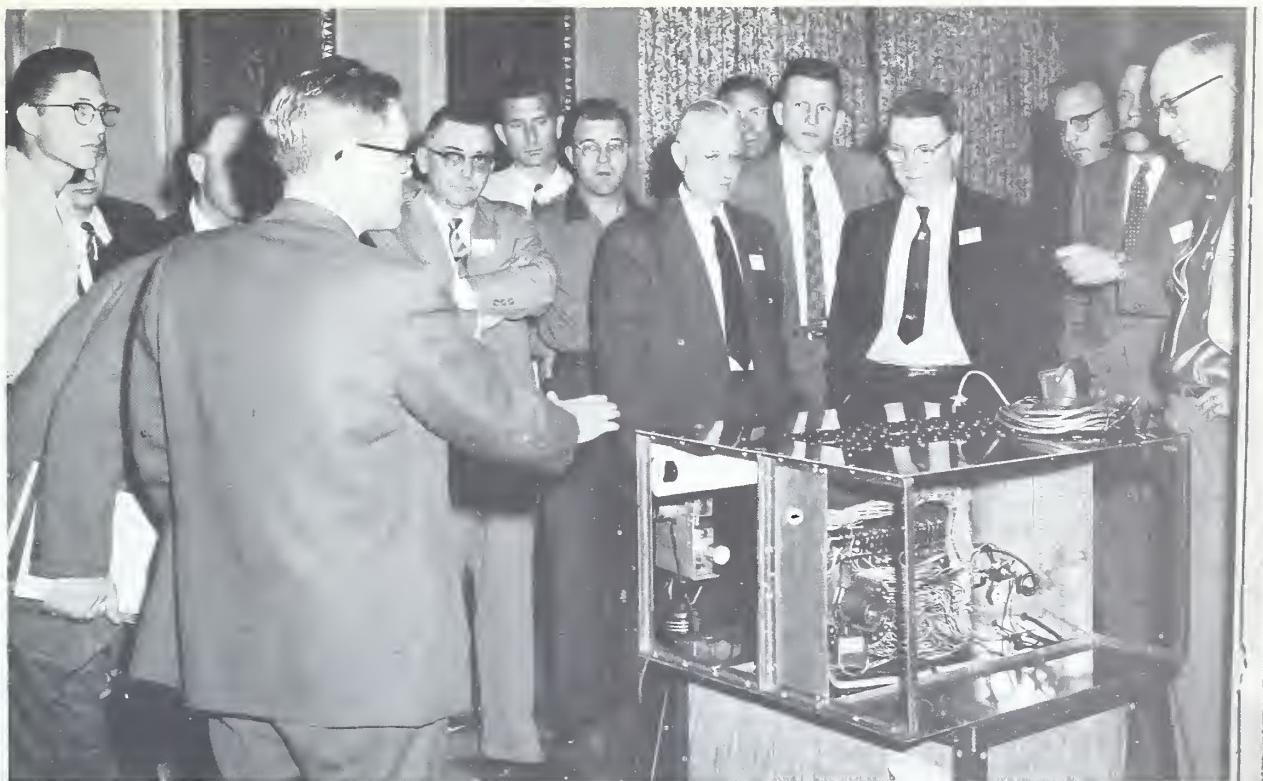
The present REA Administrator, David A. Hamil, has charged all REA borrowers and others in the telephone business to take "a good hard look at rural areas which are without adequate service or which have no service at all.

"Some 35 percent of U.S. farms still lack telephone service, and still more lack modern dial service. There are serious gaps in our national communications network, and they must be filled.

"I see two ways in which the task might be accomplished. Rural people without modern telephones might meet to see whether their obsolete mutual telephone systems might not be consolidated into a system eligible for an REA loan. Those without any service might try to develop an organization to supply it. The rural people affected would have to take the initiative in forming a new cooperative or company to apply for an REA loan, if an established organization is unwilling or unable to provide the needed service.

"Telephone companies already operating in rural areas should consider expanding their lines into nearby sections without service.

"This combination of actions—the formation of new telephone cooperatives and the expansion of already existing telephone organizations—should do much to fill the gaps in telephone service in rural America."



REA Area Director Thomas J. McDonough (left) shows engineers a traffic recorder. The camera takes a picture of traffic meters once a minute. The film shows a manager how many calls have been placed, as well as the length of each call. The exhibit was part of an REA Telephone Engineering Symposium at Memphis, Tenn.

9. Toward Better Service

WORKING FOR REA proved a new kind of experience for telephone technicians and engineers. While they were asked to make use of skills and knowledge already acquired, they were also charged with developing a new and specialized telephone technology suited to small rural systems in sparsely settled areas. This was a challenging new field, calling for imagination, flexibility, and the willingness to experiment.

Job number one was to take a critical look at existing telephone technology and to sort out those concepts which seemed useful for rural dial system construction. Then came the task of developing new concepts of telephone design, engineering, manufac-



Charles R. Ballard, REA outside plant engineer, shows contractors and engineers a new type of buried plant terminal at the Memphis symposium.

turing, construction, and testing.

REA set up a small group of engineers to make sure that all products and materials used on REA borrowers' systems met acceptable specifications. Sometimes there were no industry specifications available, and REA staff engineers had to establish them. Borrowers cooperated by permitting field tests of new materials on their systems, and the results of these trials have been useful to the whole telephone industry.

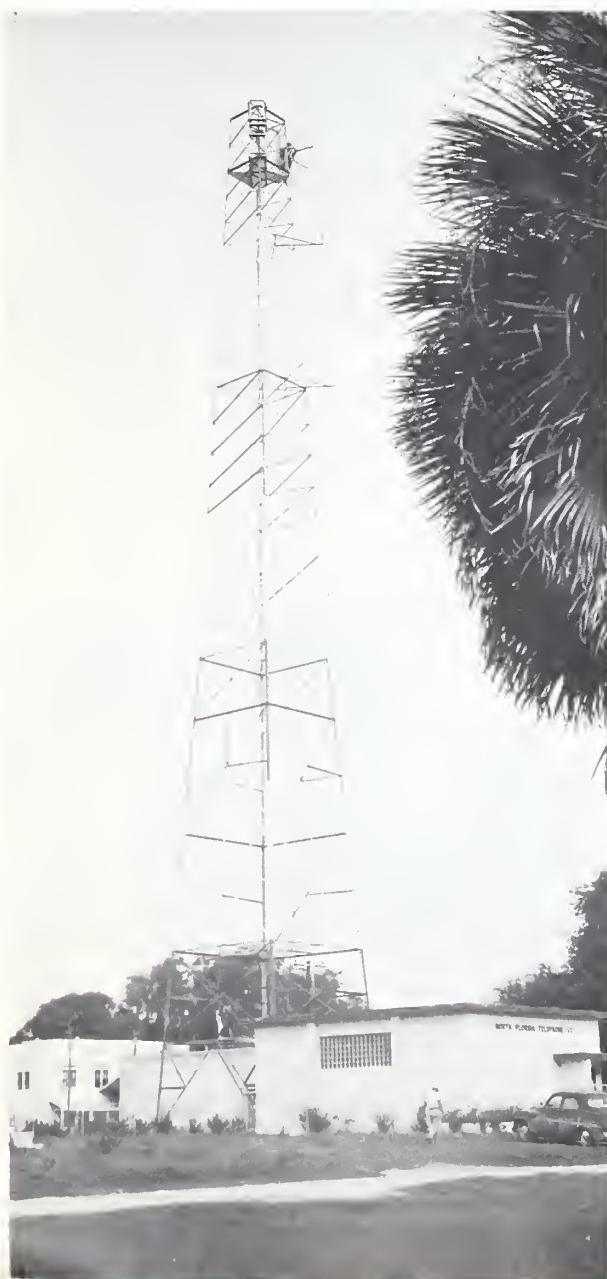
Among other things, REA engineers developed construction assembly units for all telephone plant items. This permitted contractors to bid competitively on the construction of borrowers' telephone plant.

The REA staff also developed standard technical specifications for automatic dial switching equipment, and this also enabled equipment makers to bid on central office equipment on a truly competitive basis. This important standardization provides REA bor-

rowers with central office equipment at the lowest possible cost.

During the first years of the telephone program, there was a critical shortage of independent engineering firms qualified to design new plant for REA borrowers. The agency has held a series of engineering symposiums to interest firms in providing services to borrowers and to help train engineering personnel. As a result, some 100 engineering firms have entered the rural telephone field over the past decade, and they have been responsible for engineering more than 200,000 miles of telephone lines on borrowers' systems.

In general, REA telephone engineers concentrate on finding ways to provide better telephone service to rural people at the lowest possible cost. They constantly search for better methods, products, and materials. They attempt to lower plant investment and reduce annual carrying charges. At best, dial tele-



Ice can mean trouble for aerial plant, as it did on the lines of Bledsoe Telephone Cooperative, Pikeville, Tenn., in March 1960. Ice storms are one of the hazards which make buried plant attractive in certain parts of the Nation.

Microwave towers, like this one erected by the North Florida Telephone Co. at Live Oak, carry telephone messages by radio across swamps, lakes, and rough terrain where conventional pole lines would be too costly.

phone plant is expensive. Any development which lowers the cost or holds it in check is important to the whole industry.

The idea of long span construction was developed by REA engineers in cooperation with industry representatives. Through the use of high strength conductors, rural telephone systems are built today with fewer than half the poles used several decades ago. This has substantially reduced the cost of outside plant.

REA played a key role in the development of plastic-insulated cable for rural use. Agency representatives worked with the rest of the industry in standardizing a color code for wire pairs, making it easier to splice cable and to locate a particular wire pair inside a cable.

REA engineers also helped develop a new plastic cable and wire suitable for burial in the ground. Now

a complete line of terminals, pedestals, and other equipment permit the construction of a whole system underground, where it cannot be harmed by tornado, ice, or hurricane.

Lacking laboratory facilities, REA must leave most research to the telephone industry and telephone equipment manufacturers. REA's technical people emphasize cooperation and industrywide participation in making developments available to rural systems.

Some of the most successful work has been done in the field of subscriber "carrier." The typical rural telephone subscriber line will carry only one conversation at a time. Since the beginning of the telephone program, REA engineers have worked closely with makers of electronic equipment to perfect the use of "carrier current techniques" so that as many as 8 or 10 conversations can take place simultaneously over 1 subscriber line. The voice is transmitted by radio,



L. L. Anderson, manager of a cooperative at Green City, examines a new terminal for buried plant. Wire is terminated above the ground.



Special plow buries plastic-coated wire near Green City, Missouri, home of Northeast Missouri Telephone Company. Wire is buried about 2 feet deep.



Service remained excellent on the Tyler system during the several days of the test. Much of the insulated carrier was buried under snow. Linemen uncovered wire under 4-foot drifts on several spans to test the effect on carrier, crossarms and accessories of a quick snap of the wire to normal sag. The test was very satisfactory.

and the signal travels along the same pair of wires used for an ordinary voice frequency.

Carrier equipment is similar to radio equipment, since transmitters and receivers are used at both ends of the circuit. With carrier, the wire pair is used for transmission instead of antennae. Carrier equipment converts ordinary speech frequencies into new frequency ranges so that a number of conversations can take place simultaneously without interference. Each different carrier channel on a wire pair is tuned to respond only to the desired conversation, just as a radio receiver is tuned to only one particular station.

Carrier circuits have many advantages. They are flexible, relatively inexpensive, quiet, and provide quality talking paths. Also, they permit telephone service to remote subscriber locations where the cost of providing service by more conventional means might prove too expensive.

Several telephone borrowers are upgrading some party-line subscribers (there are usually eight to a line) to reduce the number of parties per line or to provide private-line service.

REA engineers are also studying the possibility of using carrier equipment on buried plant to provide

The Tyler (Minn.) Telephone Company built 450 circuit miles of long span line to test the long span theory during the winter of 1959-60. The long span concept relies on making span lengths long enough and wire just high enough above ground so that ice-loaded insulated wire will rest on the ground without breaking. The wire on this span had an ice load 1 inch in diameter when it sagged to the ground. The whole system suffered practically no damage from the storm, and service remained uninterrupted.



Subscribers on many rural systems can dial calls miles from home on mobile radiotelephone sets. Connections between a mobile telephone and a home telephone, or between two mobile telephones, are completed by the dial central office equipment. Mobile dial service is more complex and costly than either dispatch or manual service.

additional circuits on existing plant and to supply high quality transmission to remote locations.

REA also has done pioneer work in microwave, to beam telephone messages to hard-to-reach locations; in mobile dial telephones, so that doctors, police, and others can have 24-hour telephone service in their automobiles; and in a new sort of long-span construction, which cannot be destroyed by heavy ice storms.

Telephone industry research already points to exciting new developments on the horizon, such as circuits which will carry many times more messages at the same time and high-speed electronic switching. Telephone instruments are being redesigned; home and farm intercommunication systems are coming into use. REA engineers are staying abreast of these developments, so that rural people will be able to share in the inventions of tomorrow. Meanwhile, the primary responsibility of REA telephone engineers is to make certain that new telephone designs and products fit logically into the small rural systems of REA borrowers over the Nation. As the gaps in this country's telephone network are filled, REA will help make sure that they are filled as economically as possible with standard equipment.

10. Picture Story:

The People Who Use the Telephones



Rural people need reliable telephone service as much, if not more, than city people . . . to call a veterinarian . . .



. . . to order feed



. . . to make an appointment with the dentist or doctor



. . . to get a replacement part for farm machinery in a hurry



. . . to hear up-to-date market information

14462



... to order a prescription

14313



... to report a prowler

N31197



... or to make a date

14424



... to hear that the family will be home for Thanksgiving

11430



... to talk with a relative in the service

14573



... or to hear pop say he'll be home for supper.

Top REA officials in the Rural Telephone Program 1949-1960



Claude R. Wickard,
Administrator,
1945-53



Ancher Nelsen,
Administrator,
1953-56



David A. Hamil,
Administrator,
1956-Present

Former Deputy and Assistant Administrators



George W. Haggard



William C. Wise



Riggs Shepperd



J. K. O'Shaughnessy

Present Officials



Ralph J. Foreman,
Deputy Administrator



Norman H. McFarlin,
Assistant Administrator
(Telephone)



Everett C. Weitzell,
Deputy Assistant
Administrator (Telephone)



Raymond W. Lynn, Chief,
Telephone Engineering
and Operations Division



1935 • 1960